

## THE PSEUDOSCORPION GENUS PARALIOCHTHONIUS (ARACHNIDA, PSEUDOSCORPIONIDA, CHTHONIIDAE)<sup>1</sup>

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The genus *Paraliochthonius* was erected by Beier in 1956 with *Chthonius singularis* Menozzi, from the littoral of the western Mediterranean Sea, as the type species. Subsequently the range of *P. singularis* has been extended to the eastern Mediterranean (cf. Beier, 1969b) and the range of the genus has been extended westward across the Atlantic Ocean to the West Indies by the discoveries of the following forms:

*P. hoestlandti* Vachon, 1960; Madeira.

*P. h. canariensis* Vachon, 1961; Canary Islands

*P. insulae* Hoff, 1963; Jamaica.

*P. puertoricensis* Muchmore, 1967; Puerto Rico.

*P. weygoldti* Muchmore, 1967; Big Pine Key, Florida.

As suggested earlier (1967, p. 162), restudy of the holotype of *Chthonius johnstoni* Chamberlin from Baja California, Mexico, and study of a new specimen from Jalisco, Mexico, have convinced me that *Morikawia* Chamberlin is synonymous with *Paraliochthonius* Beier. This adds at least three more species to *Paraliochthonius*, as detailed below, and extends the range of the genus into the Pacific Ocean area.

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FAMILY CHTHONIIDAE HANSEN  
TRIBE TYRANNOCHTHONIINI CHAMBERLIN

This tribe, as characterized by Chamberlin (1962, p. 310), has the trichobothria *isb* and *ib* of the palpal chela transversely paired in a median or subbasal position on the dorsum of the hand; marginal teeth of the chelal fingers spaced and acute; coxal spines occurring only on the second pedal coxae; intercoxal tubercle absent. These characters still appear perfectly adequate to distinguish this tribe from all other chthoniids; however, it should be noted further that all members of the tribe have one or more forward-projecting setae (= spine-like setae) on the inner side of the palpal chela, which are longer and heavier than the usual vestitural setae. Four groups of species are now included here, and may be distinguished by the following key (taken in part from Chamberlin, loc. cit.):

Key to the genera and subgenera of the Tyrannochthoniini

1. Palpal chela provided interiorly with three or more forwardly-projecting, spine-like setae, variously developed but longer and more robust than the usual vestitural setae, located on hand and on bases of fingers.....2
- Palpal chela at most with a single, spine-like seta located interiorly at base of fixed finger .....3
2. Four eyes; tergites 1-4 with four or more setae; appendages of usual proportions for epigeal members of Chthoniidae; chelal fingers homodentate; spine-like setae of chela moderately prominent; epigeal forms.....genus *Paraliochthonius* Beier
- Eyeless; tergites 1-4 with only two setae; appendages attenuated; chelal fingers heterodentate; spine-like setae of chela remarkably prominent; cavernicolous forms .....subgenus (or genus) *Troglochthonius* Beier
3. Chelal hand more or less strongly constricted proximad of base of fixed finger (=flask-shaped); digital condyles and attachment apodemes of movable finger prominent and heavily sclerotized .....genus (or subgenus) *Lagynochthonius* Beier
- Chelal hand not constricted, of normal facies; digital condyles and apodeme not large or conspicuous.....genus *Tyrannochthonius* Chamberlin

The two species of *Troglochthonius* are similar in most basic respects to the species of *Paraliochthonius*, but are adaptively modified for life in caves (loss of eyes, reduction of tergal setae, attenuation of appendages). It would seem preferable to consider *Troglochthonius* as a polyphyletic group (subgenus) of the genus *Paraliochthonius*, analogous in its constitution to *Neobisium* (*Blothrus*), *Roncus* (*Parablothrus*) and *Kleptochthonius* (*Chamberlinochthonius*), at least until some more fundamental differences are discovered.

Beier erected *Lagynochthonius* (1951) as a subgenus of *Tyrannochthonius* and continues to consider it as such (cf. 1970). However, Chamberlin (1962) considered the two groups sufficiently different to deserve full generic status. I am inclined to agree with Chamberlin because of the basic difference in attachment of the movable chelal finger to the hand and to the fact that members of *Lagynochthonius* and *Tyrannochthonius* are often sympatric.

#### GENUS *Paraliochthonius* BEIER

*Paraliochthonius* Beier, 1956, p. 58; Vachon, 1960, p. 337; Vachon, 1961, p. 101; Chamberlin, 1962, p. 310; Beier, 1963, p. 76; Hoff, 1963, p. 23; Muchmore, 1967, p. 162.

*Morikawia* Chamberlin, 1962, p. 311.

The diagnosis of Beier (1963), with the modification recommended by Hoff (1963), is generally satisfactory, but a couple of points of clarification and addition should be made. As Vachon, Hoff and Muchmore have clearly shown, a forward-projecting spine-like seta may occur on the base of the movable finger of the chela in addition to those found on the hand and fixed finger; it seems likely that this spine, more or less well-developed, is a characteristic feature of the genus.

Vachon and Muchmore have both pointed out that in the forms considered by them the coxal spines arise from a common base. Examination of the holotype of *P. insulae* Hoff reveals the same situation. It appears likely that this condition, also, is characteristic of the genus.

As shown in Muchmore (1967) and below, the anteriormost seta in the cheliceral flagellum of several species of *Paraliochthonius* is strongly curved near the base so as to bend down and away from the other setae. The same condition exists in the holotype of *P. insulae*. Examination of a limited number of specimens of *Tyrannochthonius* and *Lagynochthonius* fails to reveal a similar condition, all the flagellar setae being more or less parallel. It appears likely that this is another characteristic difference between the genera.

*Diagnosis* (emended)—Carapace about as long as broad, narrowed posteriorly; with 16 prominent vestitural setae, 4 at anterior margin and 2 at posterior margin, and sometimes additionally with a shorter seta in front of each anterior eye; epistome long and pointed; anterior eyes corneate, posterior eyes sometimes less well-developed. First and

second tergites with 4, third tergite with 4-5 and the following tergites with 6-8 setae. Cheliceral hand with 4 or 5 setae; flagellum with about 8 pinnate setae, the anteriormost being strongly curved near its base so that it is bent down and away from the others; little or no evidence of a galeal elevation. Palpal chela with trichobothria *ib* and *isb* on the dorsum of the hand, proximal to the middle; inner face of chela with 2 or more forward-projecting, spine-like setae situated on or near the base of the fixed finger, and usually a similar seta on the base of the movable finger; chelal fingers longer than hand, with many pointed, spaced marginal teeth. Only coxae of second legs with a row of pinnate coxal spines, arising from a more or less prominent common base. Intercoxal tubercle absent.

*Remarks:* As mentioned below, *Chthonius johnstoni* Chamberlin, the type species of the genus *Morikawia* Chamberlin, has all the characteristics of a member of *Paraliochthonius* Beier. Because this is so, *Morikawia* must fall as a synonym of *Paraliochthonius*. As a result, the various species which have been assigned to the genus *Morikawia* must be accommodated elsewhere. The disposition of only two of these is certain, i.e. *Chthonius johnstoni* and *Tyrannochthonius takashimai* Morikawa, both of which belong to *Paraliochthonius*. The descriptions of the several species from the Pacific Ocean area which Beier (1964, 1966a, b, c, 1967a, b, 1968, 1969a) has assigned to *Morikawia* are not detailed enough to allow decisions about their generic status; their placement must, therefore, await restudy of the type material.

Von Helversen (1968) and Beier (1969) have suggested that there are definite habitat differences between the species of *Paraliochthonius* and those of *Morikawia*, the former living in or near the littoral zone of the sea and the latter living in leaf litter (presumably away from the beach). However, such strict differences are not entirely supported by the evidence. *T. takashimai* Morikawa was, as a matter of fact, found in the intertidal zone, "under stones flooded at high-tide" (Morikawa, 1958, p. 7), and Chamberlin (1962) confessed that he did not know for certain where the type of *C. johnstoni* was found, it being "possible that the specimen in question was also from a littoral habitat (e.g. under a stone or piece of driftwood on the beach)" (p. 313). To be sure, most of the Pacific area forms placed by Beier in *Morikawia* were found in litter or in caves, but even if these are found to conform morphologically to *Paraliochthonius*, it will not be surprising to find different species of the genus occupying quite different

habitats. Well-known genera with both litter-dwelling and littoral species include *Neobisium*, *Dinocheirus* and *Parachernes* (cf. Weygoldt 1969, p. 112-114), and *Lechytia*, which is usually found far from the sea but has one species. *L. sakagamii*, living "under stones at the coast" on Marcus Island (Morikawa, 1960, p. 111).

*Paraliochthonius johnstoni* (CHAMBERLIN), NEW COMBINATION

*Chthonius johnstoni* Chamberlin, 1923, p. 357.

*Tyrannochthonius johnstoni*, Chamberlin, 1929, p. 75; 1931, pp. 56, 92; Beier, 1932, p. 64.

*Morikawia johnstoni*, Chamberlin, 1962, p. 312.

Direct comparison of the holotype of *Chthonius johnstoni* Chamberlin (JC 111.01001) with specimens of *Paraliochthonius puertoricensis*, *P. weygoldti* and *P. mexicanus* leaves no doubt that all are congeneric. Specifically, the coxal spines of all arise from a more or less prominent common base—there is no basis here for generic separation. Further, the number and distribution of the spine-like setae on the palpal chela, the form of the cheliceral flagellum, and other diagnostic features, are similar in all specimens.

*Paraliochthonius takashimai* (MORIKAWA), NEW COMBINATION

*Tyrannochthonius johnstoni takashimai* Morikawa, 1958, p. 6.

*Tyrannochthonius takashimai*, Morikawa, 1960, p. 110.

*Morikawia takashimai*, Chamberlin, 1962, p. 313.

As Chamberlin has indicated (1962, p. 313-4), *takashimai* is congeneric with *johnstoni*. In spite of the errors in Morikawa's figure of the palpal chela, it is now clear that this species, like *johnstoni*, belongs to *Paraliochthonius*, as defined above. [It should be pointed out here that in addition to the errors mentioned by Chamberlin (loc. cit.), Morikawa's figures of the chela of *takashimai* (both 1958, p. 6, fig. 1A and 1960, plate 5, fig. 4) show setae *ib* and *isb* on the ventral rather than the dorsal side of the hand!]

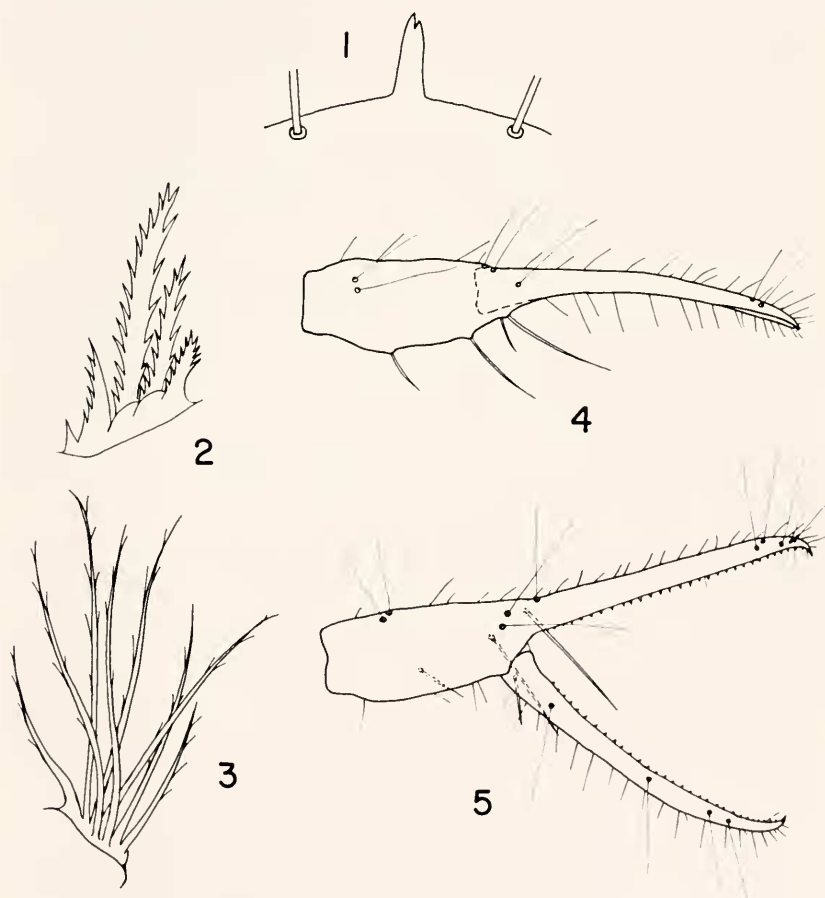
*Paraliochthonius canariensis* (VACHON), NEW COMBINATION

*Paraliochthonius hoestlandti canariensis* Vachon, 1961, p. 98; Beier, 1963, p. 78.

In my opinion, the many differences cited by Vachon (loc. cit., p. 100-101) between this form from the Canary Islands and *P. hoestlandti* from Madeira are sufficient to justify considering the two as separate species. Geographical separation of the two by nearly 300 miles of open ocean makes their reproductive separation seem likely.

*Paraliochthonius mexicanus*, NEW SPECIES  
(Figs. 1-5)

*Material:* Holotype female, taken at Manzanilla, Tenacatita Bay, Jalisco, Mexico on 4 November 1966 by W. G. Evans. The type specimen is in the collection of the Department of Entomology, University of California, Davis.



FIGS. 1-5 *Paraliochthonius mexicanus*, new species, holotype female. Fig. 1. Middle portion of anterior margin of carapace, showing epistome. Fig. 2. Coxal spines of left coxa II. Fig. 3. Flagellum of right chelicera. Fig. 4. Dorsal view of left palpal chela. Fig. 5. Lateral view of right chela.

*Description: Female:* Generally similar to *Paraliochthonius johnstoni* but larger. Carapace about as long as broad; epistome a prominent, furcate process (Fig. 1). Four eyes present; anterior ones corneate and located one ocular diameter from carapacial margin; posterior ones smaller, non-corneate and one ocular diameter from anterior ones. Chaetotaxy of carapace  $d4d-4-4-2-2=16+2d$ , the dwarf setae (d) being located anterior and ventral to the anterior eyes.

Abdomen typical; pleural membranes finely granulate. Tergal chaetotaxy 4:4:5:6:7:7:8:7:7:4:T2T:O. Sternal chaetotaxy 9:(3)6(3):(3)6(3):10:10:10:-10:9:9:0: mm. Coxal chaetotaxy 2-2-1:0-3-0:2-1-CS:2-3:2-3. Coxal spines irregularly pinnate, 6 on right coxa II, 5 on left; arranged in a row on a slightly elevated common base (Fig. 2). No intercoxal tubercle. Genital area typical.

Chelicera slightly longer than carapace, 2.1 times as long as broad; palm with 5 setae; fixed finger with 7-8 teeth, distal one largest; movable finger with row of 8-10 small teeth and a small denticle midway between distal end of row and finger tip; no galeal elevation evident; serrula exterior with 21 blades; flagellum with 8 irregularly pinnate setae, the distal one separated from the others and characteristically curved (Fig. 3).

Palps typical of the genus; proportions of segments and placement of major setae as shown in Figs. 4 and 5. Trochanter 1.95, femur 4.65, tibia 2.15, and chela 5.4 times as long as broad; hand 2.0 times as long as deep; movable finger 1.78 times as long as hand. Positions of trichobothria of chela as illustrated. Chelal hand with four spine-like setae on inner face, the more proximal two considerably shorter and more slender than the distal pair; movable finger with a slender spine-like seta on inner face at base. Fixed finger of chela with row of 30 acute, widely-spaced teeth and 2 small, rounded denticles at the proximal end of the row; movable finger with 29 similar teeth and 1 small denticle.

Legs of typical facies, moderately slender; entire femur 3.4 and tibia 4.9 times as long as deep. Leg IV with tactile setae on tibia 0.43, on metatarsus 0.27, and on telotarsus 0.33, 0.61 and 0.74 the length of segment from proximal end.

*Measurements* (mm): Body length 2.1 mm. Carapace 0.54 long, 0.58 broad across eyes; epistomal process 0.04 long; anterior eyes 0.055 in diameter. Chelicera 0.59 long by 0.28, movable finger 0.29. Palpal trochanter 0.30 by 0.155; femur 0.745 by 0.16; tibia 0.365 by 0.17; chela 1.08 by 0.20; hand 0.395 by 0.195; movable finger 0.705 long. Leg I: basifemur 0.41 by 0.075; telofemur 0.19 by 0.07; tibia 0.23 by 0.055; tarsus 0.38 by 0.045. Leg. IV: entire femur 0.63 by 0.185; tibia 0.44 by 0.09; metatarsus 0.185 by 0.06; telotarsus 0.38 by 0.045.

*Remarks:* The new species, *Paraliochthonius mexicanus*, is easily distinguished from *P. johnstoni*, its nearest neighbor, by its considerably larger size, relatively longer chelal hand, more slender legs, and greater numbers of setae on tergites 5-9.

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**3.0193 The pseudoscorpion genus *Paraliochthonius* (Arachnida, Pseudoscorpionida, Chthoniidae)**

ABSTRACT.—The diagnosis of the genus *Paraliochthonius* Beier is restated and modified slightly. The genus *Morikawia* Chamberlin is shown to be a synonym, with the inclusion in *Paraliochthonius* of both *Chthonius johnstoni* Chamberlin and *Tyrannochthonius takashimai* Morikawa. A new species, *P. mexicanus*, from Jalisco, Mexico, is described.

*Descriptors:* Arachnida; Pseudoscorpionida; Chthoniidae; *Paraliochthonius*, emended diagnosis; *Morikawia*, new synonymy; *Paraliochthonius mexicanus*, new species, from Jalisco, Mexico.